

Factors associated with depression, anxiety and stress among patients with diabetes mellitus in primary health care: Many questions, few answers

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Fisekovic Kremic MB. Factors associated with depression, anxiety and stress among patients with diabetes mellitus in primary health care: Many questions, few answers. *Malays Fam Physician*. 2020;15(3);54–61.

Keywords:

diabetes mellitus, risk factors, cognitive disorders, general practice

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Abstract

Introduction: People with diabetes mellitus (DM) may have concurrent mental health disorders and have been shown to have poorer disease outcomes.

Objective: The aim of this study to determine the prevalence of DASS in patients with diabetes mellitus without mental disorders, aged 20 years or more, in primary health care, and to determine any association between DASS and patients' sociodemographic and clinical attributes.

Methods: This was a cross-sectional study conducted in a primary health care center, in the department of general practice. Patients with DM who visited the doctor and agreed to fill in the questionnaire were included in the study. Data were collected using the questionnaire DASS-21. Descriptive statistics, the Pearson chi-square test, and logistic regression analysis were used to analyze the data.

Results: Out of a total of 102 respondents with DM, 29 (28.4%) had some form of psychological symptoms. The prevalence of DASS was 16.7%, 16.6%, and 23.5%, respectively. There was no significant difference between sociodemographic variables according to stress status. Respondents aged 40–49 years more often showed emotional states of depression and anxiety. There was a significant association between emotional status of DASS and HbA1c values. Logistic regression analysis indicated that age (OR=2.57, 95% CI: 1.59-4.13) was a predictor of depression and anxiety.

Conclusion: Unpleasant emotional states DASS are common in patients with DM, depression (16.7%), anxiety (16.6%), and stress (23.5%). Age is the strongest predictor of DASS status. The screening and monitoring of unpleasant emotional states in people with diabetes should be performed from a young age.

Introduction

The incidence of diabetes mellitus is increasing. It is recognized that many person with chronic illnesses also have undiagnosed comorbidities, including depression, anxiety, and stress (DASS).¹ People with diabetes mellitus may have concurrent psychological symptoms and are shown to have poor disease outcomes.² Mental illness or mental health disorders, which refer to a wide range of mental health conditions, affect mood, thinking, and behavior.³ Some mental illnesses include depression, anxiety disorders, schizophrenia, eating disorders, and addictive behaviors. Signs and symptoms of mental illness can vary and can affect emotions, thoughts, and behaviors. Sometimes mental health disorder symptoms present as physical problems, such as headaches, back pain, stomach pain, or other unexplained pains.^{3,4}

In this country, approximately 600,000 persons (8.2% of the population) suffer from diabetes. In Serbia, as in developed countries worldwide, diabetes is the fifth leading cause of death⁵ and also the fifth cause of disease.⁶ In this country, approximately 3,000 persons die from this disease each year.⁵ The World Health Organization projected that 438 million people will fall ill from diabetes by 2030. Although the highest incidences are recorded in developed countries, the largest increase in diabetes diagnoses is expected in developing countries like this one.⁷ More studies have been done to determine the prevalence of depression, anxiety, and stress (DASS) in patients with diabetes.^{2,8-10} Adverse socioeconomic circumstances early in life increase the risk of diabetes mellitus and late-life cognitive disorders.¹¹ DM often appears as a co-morbidity of a more psychiatric illnesses, complicating its outcome. People with diabetes are 1.5 times more likely to develop

DASS, especially anxiety and depression, regardless of age, ethnicity, or socioeconomic status.¹² Although psychological and psychiatric problems are frequently present in people with DM, in most cases these are neither diagnosed nor treated, to the patients' detriment.^{13,14}

This study was conducted to determine the prevalence of DASS in primary care patients 20 years or older with DM without DASS and to determine any association between DASS and patients' sociodemographic and clinical characteristics.

Methods

1. Study Design

This was a cross-sectional study conducted from December 2017 until February 2018. This study was conducted in the primary healthcare center in New Belgrade in the department of general practice.

This study included patients 20 years or older with diabetes mellitus (DM), without the presence of DASS, who visited the doctor for one reason or another. Patients diagnosed with mental disorders were excluded from the study. The prevalence of depression in the area studied ranged from 8 to 18%. The minimum number of samples was calculated using Kish's formula: Sample size = $z^2 (p (1-p)/c^2)$, where $z = 1.96$ for 95% confidence interval (CI)

In this equation, p = prevalence (of depression for DM based on Andreoulakis study: 8-18%),¹⁰ and c = desired level of precision. The minimum sample size was 113 DM patients but without mental disorders.

2. Study Variables

Data were collected using the questionnaire DASS-21.¹⁵ Patients with DM who visited the doctor and agreed to fill out the questionnaire were included in the study. This self-administered questionnaire consisted of three sections: sociodemographic information, DM severity, and DASS detection, and it was given to the patients when visiting a doctor of general practice.

The sociodemographic data of the patients were recorded, including age, sex, marital status, education level, and occupation. Factors that could affect DM severity were also recorded, such as smoking status, presence of comorbidities, family history of DM, DM duration, therapy, number of doctor's visits, HbA1c levels, and blood sugar levels. The section on the detection of DASS was completed using the validated DASS-21 questionnaire. The DASS-21 questionnaire has 21 items, a set of three self-reported scales designed to measure DASS. The DASS-21 questionnaire has been translated into multiple languages, including Serbian, which has been validated for its use.¹⁵ The DM patients were asked to estimate their experience of each symptom on a 4-point severity scale ranging from 0 ("does not apply to me") to 3 ("applies to me most of the time"). These scores were added up and categorized as normal, mild, moderate, severe, or extremely severe, according to the manual. Values of DASS obtained were then transformed for further analysis. The DASS has no direct implications for the allocation of patients to diagnostic categories postulated in classification systems, since it is predominantly aimed to measure DASS symptoms in both clinical and nonclinical samples. Therefore, the DASS-21 questionnaire is only a screening tool.¹⁶

3. Statistical Analysis

All questionnaires were checked and entered into the statistical software SPSS 20. Data were expressed as frequencies (%) for categorical variables, and all the continuous variables were expressed as mean and standard deviations. The Pearson chi-square test was used to measure the differences between the variables. Significant associations were found, with a p -value < 0.05 .

All variables that were significantly associated with the outcome measure ($p < 0.05$) were entered into a logistic regression model and were identified as outcome predictors. Finally, the odds ratios (OR) and confidence intervals (95% CIs) were also calculated.

Results

A total of 102 patients who visited a PHC doctor successfully completed the questionnaire. Out of a total of 102 respondents with DM, 29 (28.4%) displayed psychological symptoms. The prevalence of depression, anxiety, and stress was 16.7%, 16.6%, and 23.5%, respectively. The mean patient age was 50 ± 7.86 years. Almost 52% of the respondents had secondary education. Approximately 77.5% of respondents were employed. More than half of the respondents had a positive family history of DM (55.9%), and more than two-thirds of the respondents (67.6%) had concurrent co-morbidities, and a majority of the patients received only oral medication (72.5%), whereas 10.8% received a combination of both oral medication and insulin. The average blood sugar level was 7.2 and HbA1c 6.4%. The sociodemographic characteristics of the respondents are shown in **Table 1**.

Table 1. Frequency distribution of respondents by sociodemographic and clinical characteristics

Sociodemographic and clinical characteristics	N (%)
Sex	
Male	49 (48.0)
Female	53 (52.0)
Marital status	
Single	21 (20.6)
Married	78 (76.5)
Widow/er	3 (2.9)
Age (years)	
≤29	1 (1.0)
30-39	8 (7.8)
40-49	38 (37.3)
50-59	41 (40.2)
≥60	14 (13.7)
Education	
Primary school	3 (2.9)
Secondary school	53 (52.0)
University	46 (45.1)
Occupation	
Employed	79 (77.5)
Unemployed	23 (22.5)
Family history of DM	
No	45 (44.1)
Yes	57 (55.9)
Smoking	
Smokers	51 (50.0)
Nonsmokers	51 (50.0)
Comorbidity	
No	33 (32.4)
Yes	69 (67.6)
DM therapy	
Oral	74 (72.5)
Insulin	17 (16.7)
Oral + insulin	11 (10.8)
DM duration (years)	
≤ 1	16 (15.7)
1 – 4.9	44 (43.1)
5 – 9.9	33 (32.4)
10 – 14.9	6 (5.9)
≥ 15	3 (2.9)

<i>Frequency of visits</i>	
Once a month	54 (52.9)
Once in two months	33 (32.4)
Once in three months	15 (14.7)
<i>Blood sugar</i>	
≤ 6.0	12 (11.8)
≥ 6.1	90 (88.2)
<i>HbA1c</i>	
≤ 5.6	14 (13.7)
5.7 – 6.5	52 (51.0)
≥ 6.6	36 (35.3)

Table 2 shows the differences between the DASS statuses and sociodemographic variables of the respondents. There was no significant difference between sociodemographic variables according to stress status, but there was a significant difference between sociodemographic variables according to depression and anxiety statuses. Respondents aged 40–49 years more often displayed depression or anxiety. However, anxiety was more prevalent among respondents who were employed.

Table 2. Difference between DASS status and sociodemographic characteristics

Sociodemographic characteristic N (%)	Depression		Anxiety		Stress	
	No	Yes	No	Yes	No	Yes
<i>Sex</i>						
Male	41 (48.2)	8 (47.1)	41 (48.2)	8 (47.1)	36 (46.2)	13 (54.2)
Female	44 (51.8)	9 (52.9)	44 (51.8)	9 (52.9)	42 (53.8)	11 (45.8)
<i>Marital status</i>						
Single	19 (22.4)	2 (11.8)	19 (22.4)	2 (11.8)	18 (23.1)	3 (12.5)
Married	63 (74.1)	15 (88.2)	63 (74.1)	15 (88.2)	57 (73.1)	21 (87.5)
Widow/er	3 (3.5)	0 (0)	3 (3.5)	0 (0)	3 (3.8)	0 (0)
<i>Age (years)</i>						
≤29	1 (1.2)	0 (0)	1 (1.2)	0 (0)	1 (1.3)	0 (0)
30-39	7 (8.2)	1 (5.9)	7 (8.2)	1 (5.9)	7 (9.0)	1 (4.2)
40-49	25 (29.4)	13 (76.5)*	26 (30.6)	12 (70.6)*	25 (32.1)	13 (54.2)
50-59	38 (44.7)	3 (17.6)	37 (43.5)	4 (23.5)	33 (42.3)	8 (33.3)
≥60	14 (16.5)	0 (0)	14 (16.5)	0 (0)	12 (15.4)	2 (8.3)
<i>Educational</i>						
Primary school	3 (3.5)	0 (0)	2 (2.4)	1 (5.9)	2 (2.6)	1 (4.2)
Secondary school	45 (52.9)	8 (47.1)	45 (52.9)	8 (47.1)	41 (52.6)	12 (50.0)
University	37 (43.5)	9 (52.9)	38 (44.7)	8 (47.1)	35 (44.9)	11 (45.8)
<i>Occupation</i>						
Employed	63 (74.1)	16 (94.1)	62 (72.9)	17 (100.0)*	58 (74.4)	21 (87.5)
Unemployed	22 (25.9)	1 (5.9)	23 (27.1)	0 (0)	20 (25.6)	3 (12.5)

There was a significant association between the emotional statuses of DASS and the HbA1c values of the respondents, especially in pre-diabetic values. In addition, there was a significant difference between anxiety status and positive family history and stress status and appearance of higher blood sugar (**Table 3**).

Table 3. Differences between DASS status and clinical characteristics

Clinical characteristic N (%)	Depression		Anxiety		Stress	
	No	Yes	No	Yes	No	Yes
<i>Family history of DM</i>						
No	40 (47.1)	5 (29.4)	42 (49.4)	3 (17.6)	38 (48.7)	7 (29.2)
Yes	45 (52.9)	12 (70.6)	43 (50.6)	14 (82.4)*	40 (51.3)	17 (70.8)
<i>Smoking</i>						
Smokers	41 (48.2)	10 (58.8)	43 (50.6)	8 (47.1)	40 (51.3)	11 (45.8)
Nonsmokers	44 (51.8)	7 (41.2)	42 (49.4)	9 (52.9)	38 (48.7)	13 (54.2)
<i>Comorbidity</i>						
No	26 (30.6)	7 (41.2)	27 (31.8)	6 (35.3)	27 (34.6)	6 (25.0)
Yes	59 (69.4)	10 (58.8)	58 (68.2)	11 (64.7)	51 (65.4)	18 (75.0)
<i>DM therapy</i>						
Oral	59 (69.4)	15 (88.2)	59 (69.4)	15 (88.2)	57 (73.1)	17 (70.8)
Insulin	15 (17.6)	2 (11.8)	16 (18.8)	1 (5.9)	13 (16.7)	4 (16.7)
Oral + insulin	11 (12.9)	0 (0)	10 (11.8)	1 (5.9)	8 (10.3)	3 (12.5)
<i>DM Duration (years)</i>						
≤ 1	15 (17.6)	1 (5.9)	15 (17.6)	1 (5.9)	15 (19.2)	1 (4.2)
1 – 4.9	36 (42.4)	8 (47.1)	35 (41.2)	9 (52.9)	33 (42.3)	11 (45.8)
5 – 9.9	26 (30.6)	7 (41.2)	27 (31.8)	6 (35.3)	24 (30.8)	9 (37.5)
10 – 14.9	5 (5.9)	1 (5.9)	5 (5.9)	1 (5.9)	3 (3.8)	3 (12.5)
≥ 15	3 (3.5)	0 (0)	3 (3.5)	0 (0)	3 (3.8)	0 (0)
<i>Number of visits</i>						
Once a month	42 (49.4)	12 (70.6)	43 (50.6)	11 (64.7)	38 (48.7)	16 (66.7)
Once in two months	28 (32.9)	5 (29.4)	28 (32.9)	5 (29.4)	27 (34.6)	6 (25.0)
Once in three months	15 (17.6)	0 (0)	14 (16.5)	1 (5.9)	13 (16.7)	2 (8.3)
<i>Blood sugar</i>						
≤ 6.0	11 (12.9)	1 (5.9)	12 (14.1)	0 (0)	12 (15.4)	0 (0)
≥ 6.1	74 (87.1)	16 (94.1)	73 (85.9)	17 (100.0)	66 (84.6)	24 (100.0)*
<i>HbA1c</i>						
≤ 5.6	12 (14.1)	2 (11.8)	13 (15.3)	1 (5.9)	14 (17.9)	0 (0)
5.7 – 6.5	39 (45.9)	13 (76.5)*	38 (44.7)	14 (82.4)*	33 (42.3)	19 (79.2)*
≥ 6.6	34 (40.0)	2 (11.8)	34 (40.0)	2 (11.8)	31 (39.7)	5 (20.8)

Logistic regression analysis (Table 4) indicated that age (OR=2.57, 95% CI: 1.59-4.13) was a predictor of depression and anxiety statuses. Therefore, DM patients should be tested with the DASS questionnaire at a young age. Other variables (occupation, family history of DM, blood sugar, HbA1c) were not predictors of DASS status.

Table 4. Logistic regression model with DASS status as the dependent variable

Independent variable	Depression			Anxiety			Stress		
	B	OR (95%CI)	p value	B	OR (95%CI)	p value	B	OR (95%CI)	p value
Age (years)	-1.062	0.35 (0.15 - 0.79)	0.012	-1.104	0.33 (0.13 - 0.86)	0.023	-0.222	0.80 (0.44 - 1.44)	0.460
Occupation	-1.619	0.19 (0.18 - 2.14)	0.182	-19.909	0	0.998	-0.597	0.55 (0.13 - 2.27)	0.408
Family history of DM	0.545	1.72 (0.50 - 5.88)	0.384	1.233	3.43 (0.83 - 14.23)	0.089	0.739	2.09 (0.75 - 5.82)	0.157
Blood sugar	-0.006	0.99 (0.75 - 1.31)	0.968	-0.320	0.73 (0.44 - 1.19)	0.207	0.003	1.00 (0.78 - 1.28)	0.981
HbA1c	-0.767	0.46 (0.17 - 1.26)	0.133	-0.652	0.52 (0.18 - 1.51)	0.231	-0.190	0.83 (0.37 - 1.85)	0.644

Discussion

The present study has shown that depression, anxiety, and stress are commonplace in patients with DM. The prevalence of DASS in our study was 16.7%, 16.6%, 23.5% respectively. Many studies showed the prevalence of depression among diabetic patients to be within the range of 8.5–27.3%. This was similar compared with other studies using the DASS-21 assessment tool.^{2,9,10,17-19}

This study found that an elevated HbA1c level was an independent risk factor of DASS.⁹ Several studies, including ours, have shown a positive association between HbA1c levels and DASS status.^{20,21} In a study in the Netherlands, several individual depressive symptoms were related to higher HbA1c levels in DM outpatients, and these associations persisted over time.²² This explained the increase in glycemia, enhanced inflammation, and insulin resistance.²³⁻²⁵ Furthermore, DASS status was also linked with poorer behavioral management of diabetes and glycemic control.²⁶ A number of studies have shown that depression is associated with poor perceived control of diabetes and poor self-care behaviours.²⁷ In addition, measurement of HbA1c might provide patients with reassurance; as a result, these patients were less depressed. Stress status has been also associated with glucose levels in DM patients. Those sick from both depression and diabetes also tend to have higher primary healthcare costs. Depression among diabetics is associated with poor glycemic control, which is one of causes of diabetic complications.²⁸ This not only puts a great burden on the healthcare system but also directly affects quality of life for patients.¹²

Our study also found that occupation appears to be a predictor for anxiety symptoms. Patients who were working were more likely to experience anxiety compared with those who were unemployed. Those employed may have been too busy to understand their illness and thus did not have time to focus on their health, which may explain their lack of DM control.

Our study revealed that a family history of DM was also a predictor of anxiety. These findings were consistent with other studies, which showed that family history was a predictor of DASS among patients with diabetes.^{9,15,18,29}

Along the same lines, age was associated with symptoms of depression and anxiety. Findings for the relationship between age and depression

in diabetes have been conflicting, with some studies reporting age as a risk factor for depression and other studies showing that younger age was related to depressive symptoms in DM patients.^{30,31} Our study shows that DM patients should be tested with the DASS questionnaire at a young age, preferably at the onset of the disease. Research has shown an increasingly clear relationship between DM and a variety of mental health issues, which indicates that DM patients should be tested as early as possible.^{32,33} In light of the prevalence of DM with psychiatric comorbidities and the negative impacts of these factors, individuals with diabetes should be regularly screened with validated questionnaires or clinical interviews.³³⁻³⁵

Various social and clinical factors, such as gender, marital status, level of education, DM duration, smoking status, number of doctor's visits, DM therapy, and comorbidities, were predicted to be associated with DASS status, but our study failed to prove such an association.²⁰ The high prevalence of DASS and the limited number of predictors imply that all patients with diabetes should be screened for DASS. Some researchers have suggested screening for depression in patients with chronic diseases, such as DM.^{17,36}

Several limitations may restrict broader application of our study. The findings of this research are limited to the PHC center in Belgrade and therefore reflect only one main city in Serbia and an even smaller sample size. For better representation and associations, we recommend that future studies involve a larger number of samples. Since this was a cross-sectional study, it did not allow for cause-and-effect relationships to be studied. Second, the DASS-21 questionnaire is only a screening tool and not diagnostic of specific psychiatric disorders. Finally, there remains the possibility of recall biases from respondents.

Conclusion

Clearly, our results show that unpleasant emotional states, DASS, are common in DM patients in Belgrade, with 16.7% experiencing depression, 16.6% experiencing anxiety, and 23.5% experiencing stress. Age is the strongest predictor of DASS status. The screening and monitoring of DASS in people with DM should be performed from

a young age. These findings also suggest that the healthcare system must evolve to better address the psychological burdens associated with diabetes. It is essential that health professionals conduct early assessments and identify DASS states in people with DM.

Acknowledgements

We are very grateful to the PHC center New Belgrade and the patients who took part in the research and who devoted their time to completing the questionnaires.

Ethical approval: The study was approved by the Ethics Committee of the Primary Health Care Center New Belgrade no. 29/5. Participation in the research was voluntary. Anonymity, confidentiality, and privacy of data were explained and guaranteed. Verbal consent was obtained from participants after explaining the research aims and the confidentiality of data.

Conflicts of interest: I declare that I have no financial or personal relationship(s) which may have inappropriately influenced me in writing this paper.

How does this paper make a difference to general practice?

- The incidence of diabetes mellitus is increasing.
- People with diabetes have a greater risk of developing unpleasant emotional states, depression, anxiety, and stress.
- DASS among diabetics is associated with poor glycemic regulation.
- This puts a great burden on the healthcare system but also directly affects quality of life in patients.
- The screening and monitoring of unpleasant emotional states in people with diabetes should be performed as soon as possible, preferably at the onset of the disease.

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